REMARKS

INTRODUCTION:

In accordance with the foregoing, claims 1, 2, 6 and 9 have been amended. Claims 1-9 are pending and under consideration.

REJECTIONS UNDER 35 U.S.C. §112:

Claims 2 and 6 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It is respectfully submitted that the above amendments to claims 2 and 6 overcome the rejections.

REJECTIONS UNDER 35 U.S.C. §102:

Claims 1-3, 5-7 and 9 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent 4,144,110 (US '110) to Luc or GB 385 473 (GB '110) to Luc.

Using independent claim 1 as an example, this claim recites "pressing a planar tip of a rotor, which . . . has a concave portion . . . against a surface of the lapped portion of said first metal member." This claim further recites "stirring said first and second metal members in the rotation directions of said rotor and in a direction of a thickness of the metal members in the concave portion." These features are shown, for example, in FIGS. 1 and 9 of the present application, which illustrate planar tip 3 in contact with the metal member W1.

In contrast, GB '473 generally relates to a process to join a circular type steel opening device to an aluminum drum by pressing a tip of a rotary tool which has a concave portion by the use of friction of the rotary tool. Specifically, the Examiner relies upon FIG. 2 of this reference, which shows a steel opening device 6 clamped to an aluminum drum top 8, and magnetic backing means 7 on a bottom portion of the drum 8. GB '473, page 5, lines 55-70. The inside surface of the tool 4 is concave, but "does not contact the work." Id., page 5, line 70 (second column). Thus, this reference does not disclose that the concave portion is against the surface of the lapped portion. Also, this reference therefore does not disclose that the metal members are stirred in a direction of a thickness of the metal members (in a direction crossing

the joining surface) in the concave portion.

With respect to US '110, the Examiner relies upon FIG. 8 of this reference as disclosing a tool having the claimed concave surface. The tool shown in FIG. 8 of US '110 is used in the apparatus of FIG. 20 of this reference. This apparatus generally relates to a process of adhering plastic sheets by pressing a tip of the rotary tool by the use of friction of the rotary tool. US '110, col. 15, ln. 67 to col. 16, ln. 14. However, US '110 does not describe or suggest the claimed feature that the metal members are stirred in a direction of a thickness of the metal members (in a direction crossing the joining surface) in the concave portion.

The present invention, as claimed, is advantageous as compared to the cited references. Specifically, the presently claimed invention improves joint strength between the metal members, and shortens tact time for processing. Also, a stirring characteristic is raised, thereby enabling refinement of the metal structure and a decrease in casting defects.

Accordingly, withdrawal of the rejection of claim 1, and claims 2-3 and 5-7 depending therefrom, is requested. Independent claim 9 is patentably distinguishable from the cited references at least for similar reasons as set forth with respect to claim 1.

REJECTIONS UNDER 35 U.S.C. §103:

Claims 4 and 8 are rejected under 35 U.S.C. §103(a) as being unpatentable over GB '473 or U.S. '110 and further in view of EP 0 893 189 (EP '189).

Claims 4 and 8 depend from independent claim 1, and are therefore patentably distinguishable from GB '473 and US '110 for at least the above reasons. It is respectfully submitted that EP '189 does not overcome the above deficiencies in these references, and it is noted that the Examiner does not rely upon EP '189 to do so. Instead, the Examiner relies upon EP '189 as teaching two rotors and removing burrs on the first metal surface.

Accordingly, withdrawal of this rejection is requested.

CONCLUSION:

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is

requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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Date: 5-20-03

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please **AMEND** claims 1, 2, 6 and 9 as follows. The remaining claims are reprinted for the convenience of the Examiner.

1. (ONCE AMENDED) A method of processing metal members, [wherein] comprising:

joining lapped portions of first and second metal members [are joined by] comprising lapping [at least two] the first and second metal members one over the other;

pressing a planar tip of a rotor, which is rotating around a central axis thereof and has a concave portion formed substantially at a center of said planer tip, against a surface of the lapped portion of said first metal member;

[rotating said rotor and stirring the portion of said first metal member in such a direction that the rotor rotates and a direction of a thickness of the metal members to be joined by the use of friction caused by the rotating motion of said rotor while keeping the metal members in a non-molten state, so as to form a non-molten stirred layer]; and

[expanding the non-molten stirred layer to said second metal member, wherein a concave portion is formed on the tip portion of said rotor] stirring a joining portion of said first metal member in a rotation direction of said rotor by the use of friction caused by the rotating motion of said rotor while maintaining the joining portion in non-molten state, to form a non-molten stirred layer and expanding the non-molten stirred layer to said second metal member, and stirring said first and second metal members in the rotation direction of said rotor and in a direction of a thickness of the metal members in the concave portion, by rotation and pressure of said rotor.

2. (ONCE AMENDED) The method of processing metal members according to claim 1, wherein [concave and convex] uneven portions differing in height in the circumferential direction are formed on the tip portion of said rotor.

3. (UNAMENDED) The method of processing metal members according to claim 1, wherein a receiving member is provided in such a manner as to face the tip portion of said rotor via the first and second metal members and a concave portion is formed in the tip portion of said receiving member.

4. (UNAMENDED) The method of processing metal members according to claim 1, wherein another rotor is provided in such a manner as to face the tip portion of said rotor via the first and second metal members, said two rotors being rotated in the opposite direction with the first and second metal members interposed between them.

5. (UNAMENDED) The method of processing metal members according to claim 1, wherein the first and second metal members are continuously joined by moving said rotor.

6. (ONCE AMENDED) The method of processing metal members according to claim 1, wherein the first metal member has a first side having a first thickness and a second side having a second thickness, thinner than the first thickness, and the tip portion of said rotor is pressed from [the side of one metal member of which thickness is smaller the other one] the second side.

7. (UNAMENDED) The method of processing metal members according to claim 1, wherein said first and second metal members are joined by allowing an alloy material, which

can mutually diffuse with said first and second metal members, to intervene between said first and second metal members at the portion to be joined;

pressing and rotating said rotor against the portion of said first and second metal members to be joined, and stirring the same portion by the use of friction caused by the rotating motion of said rotor while keeping the same in a non-molten state, so as to form a non-molten stirred layer; and

expanding the non-molten stirred layer to said second metal member.

8. (UNAMENDED) The method of processing metal members according to claim 1, wherein said first and second metal members are joined while removing burrs produced on said first metal member in the vicinity of said rotor due to the rotating and pressing motion of said rotor.

9. (ONCE AMENDED) A method of processing a metal member, [wherein] comprising:

reforming [the] a surface of said metal [members] member [is reformed by] comprising pressing a planar tip of a rotor, which is rotating around a central axis thereof and has a concave portion formed substantially at a center of said planar tip, along the axis and against said metal member; and

[rotating said rotor and stirring said metal member in such a direction that the rotor rotates and a direction of a thickness of the metal members by the use of friction caused by the rotating motion of said rotor while keeping the same in a non-molten state,

wherein a concave portion is formed on the tip portion of said rotor] stirring said metal member in a rotation direction of said rotor and in a direction of a thickness of the metal member in the concave portion by rotation and pressure of said rotor.